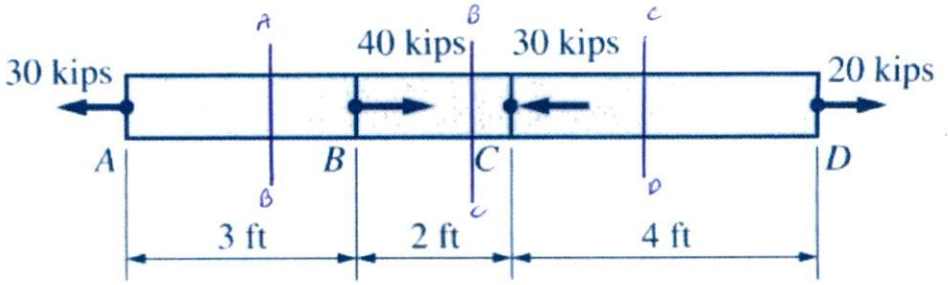
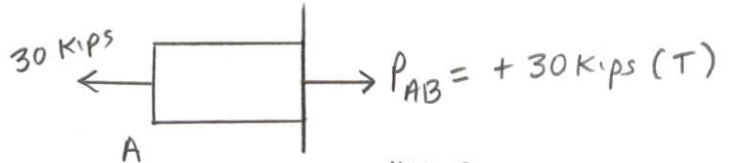
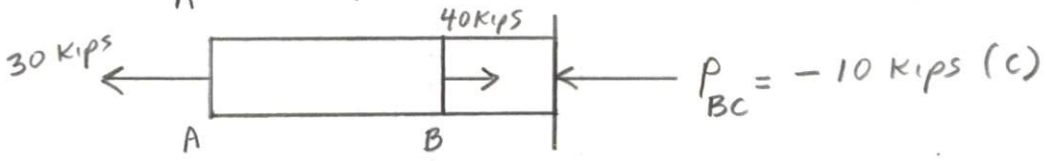
10-9

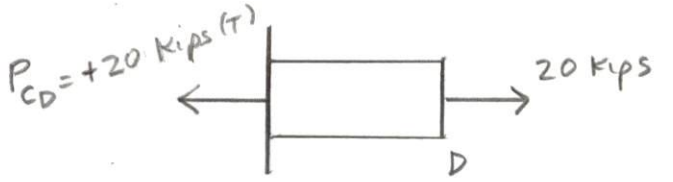
A brass bar having a uniform cross-sectional area of 2 in.^{2} is subjected to the forces shown in Fig. P10-9. Determine the total deformation of the bar. The modulus of elasticity of brass is E = 17 X 10^3 ksi.

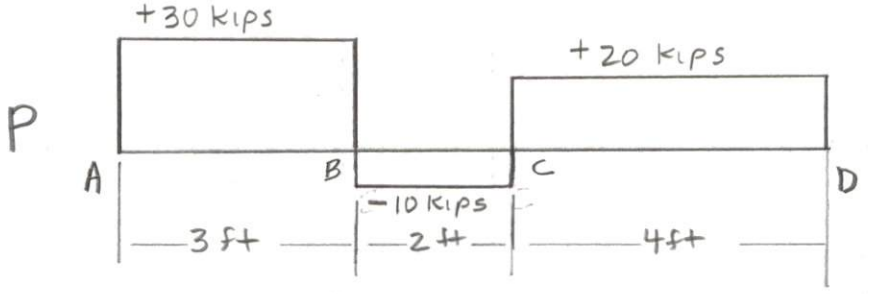


Solution.









$$\delta_{AD} = \delta_{AB} + \delta_{BC} + \delta_{CD}$$

$$= \frac{(+30\ \text{kips})(3\ \text{ft} \times 12\ \text{in/ft})}{(2\ \text{in}^2)(17\,000\ \text{kips/in}^2)} + \frac{(-10\ \text{kips})(2\ \text{ft} \times 12\ \text{in/ft})}{(2\ \text{in}^2)(17\,000\ \text{kips/in}^2)} + \frac{(+20\ \text{kips})(4\ \text{ft} \times 12\ \text{in/ft})}{(2\ \text{in}^2)(17\,000\ \text{kips/in}^2)}$$

$$= +0.0318\ \text{in.} - 0.0071\ \text{in.} + 0.0282\ \text{in.}$$

$$= +0.0529\ \text{in. (elongation)}$$